

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MARYLAND**

UNITED STATES OF AMERICA

v.

HOAU-YAN WANG,

Defendant.

CASE NO.: 8:24-CR-211-TDC

**DEFENDANT’S REPLY IN SUPPORT OF HIS MOTION TO EXCLUDE
DR. BROOKES’ TESTIMONY**

The Government’s efforts to show Dr. Paul Brookes is sufficiently qualified to testify as an expert about image analysis fail. While Dr. Brookes may have prepared Western blots during his research on metabolism and heart attacks, preparing Western blots is a very different task than analyzing the resultant images for supposed manipulation. The Government’s argument to the contrary has three primary flaws. First, the Government relies heavily on scientific articles that evidence a wide range of approaches to image analysis and demonstrate that the scientific community has yet to settle on a verifiable, generally accepted process. Second, the Government has not demonstrated that Dr. Brookes’ approach is scientifically reliable because (1) the Government has not pointed to a single criminal or civil case in which such a method has been deemed acceptable, (2) the Government’s claimed validation of Dr. Brookes’ approach by pointing to the Office of Research Integrity (“ORI”)’s use of image analysis fails because, among other things, ORI makes misconduct findings

based on less-culpable conduct and a lesser burden of proof than apply in this criminal case, and (3) Dr. Brookes admits that he cannot be certain about his opinions. For these reasons and those set forth in his opening brief, Dr. Wang respectfully requests that the Court grant his motion to exclude Dr. Brookes.

1. The Government cannot support its claim that Western blot image analysis is a “long-established discipline.”

The Government improperly conflates the scientific community’s desire to detect and curb improper image manipulation with agreement about a generally accepted method for doing so. While some scientists are researching viable techniques for analyzing scientific images for manipulation, this research has led to a multitude of individual efforts rather than a unified approach. Many of those scientists, like Dr. Brookes, are acting without the approval of their universities, in anonymous internet forums, and/or as activist short sellers of stock in pharmaceutical companies. The field of image analysis has not yet gained the imprimatur of reliability from the scientific community as a whole.

Indeed, while the Government relies on a 2022 article entitled “SILA: A System for Scientific Image Analysis” to support its claim of reliability (Docs. 85 at 5; 91 at 7), the relatively recent article actually confirms the lack of a scientifically recognized or validated review process. The article states: “Despite the invaluable previous efforts of the scientific community, the problem of scientific image integrity verification is still open, growing in worldwide occurrence and relevance, and still

needing attention.” Moreira, D., Cardenuto, J.P., Shao, R. et al. SILA: a system for scientific image analysis. *Sci Rep* 12, 18306 (2022) (emphasis added). The article notes “the *lack of a unified benchmark* that allows the principled evaluation of different techniques” which “hinders the advance of the state of the art,” in part because it is “not easy” for researchers to “either compare or reproduce each others’ results.” (*Id.* (emphasis added)). The SILA article’s authors also note that to the best of their knowledge, there is “no large dataset freely available out there containing diverse, well-documented, and confirmed cases of image manipulations, with rich annotations that are precise enough to allow the calculation of objective metrics.” (*Id.*). While the authors attempt to take a “first step” in the direction of establishing a method, there is nothing to suggest that the scientific community has adopted their method as generally accepted and, even if it had, it is not the method used by Dr. Brookes. (*Id.*). None of the other peer-reviewed literature the Government cites fares any better because it was all published prior to and cited by the SILA article discussing a general lack of scientific consensus. (*Id.* at 9-10).

In fact, many of the Government’s cited articles concede there exists a problem that needs, but does not yet have, a solution. For example, the 2004 Rossner and Yamada article discusses the need for an image analysis solution. According to the SILA article:

Rossner and Yamada early described the temptation of manipulating images for scientific publication, due in part to the availability of editing

tools such as Adobe Photoshop. They outlined hypothetical image manipulations problematic from a biological research standpoint, whose detection is worth pursuing when developing tools to verify integrity.

(*Id.* at 9 (citing Rossner, M. & Yamada, K. What's in a picture? The temptation of image manipulation. *J. Cell Biol.* 166, 11-15 (2004)). Similarly, the 2016 Bik article sought to estimate the frequency of image manipulation. Notably, the authors searched for image reuse within already published scientific papers by “manually screen[ing] 20,621 papers in 40 journals, using color adjustments and visual comparison in Apple Preview. With this approach, the [authors] claimed the identification of 782 papers (3.8%) containing duplicated images.” (*Id.* at 9-10 (citing Bik, E., Casadevall, A. & Fang, F. The prevalence of inappropriate image duplication. *Biomed. Res. Publ.* 7 (2016)). But taking steps to identify the prevalence of an issue is different from validating a review process to ensure accurate detection of that issue. And, Dr. Brookes does not claim to have used the “color adjustment and visual comparison in Apple Preview” method used in the Bik paper, so even if it were separately validated (which it isn't) that method is further irrelevant to Dr. Brookes' analysis.

While the Government spends a full page citing articles dedicated to development and use of software or artificial intelligence tools to automatically detect image manipulation in Western blot images (Doc. 91 at 7), Dr. Brookes employs a manual method, not an automated tool, that is not validated by any of the cited

articles. And even as to the automated tools, the papers show nothing more than suggested and not separately validated tools that are being tested to locate manipulated images, some of which remain in beta testing. (Exhibit 4 at 15).

The Government's citations to scientific literature do not change the fact that Dr. Brookes' methods are not generally accepted in the scientific community. Using them as a cornerstone of a criminal prosecution amounts to junk science that sets a dangerous precedent for our justice system.

2. The Government has failed to show that Dr. Brookes' methods are scientifically reliable.

Beyond its cited journal articles, the Government cites to not a single criminal or civil case that analyzes or adopts a relevant method of image analysis, apparently conceding that no such cases exist. Instead, the Government claims that many of the tools Dr. Brookes has used (but, notably, not his method) are publicly available via the Department of Health and Human Services website and used by companies, grant sponsors, and universities. (*Id.* at 8-9). But available, and even commonly used, are not the same thing as sufficiently reliable, and individual tools are not the same thing as an analytical method. Tellingly, the Government ignores the fact that Dr. Wang used many of these tools himself, so if their application makes analysis reliable and accepted, then Dr. Wang's protocols must be similarly reliable.

The Government has also failed to show that any of the tools or methods has a known error rate or has been tested and found to accurately detect known fabrication.

The Government attempts an end run around this lack of testing by arguing that ORI has relied on certain tools and methods in its own investigations and adjudications. (See Doc. 91 at 8-11). This argument is problematic for several reasons. First, ORI determines misconduct based on lower thresholds than are required here. 42 C.F.R. § 93.103. Indeed, ORI may find misconduct by a “preponderance of the evidence” for conduct committed “recklessly.” (*Id.* §§ 93.103(a), 93.103(b)). Here, the Government must establish beyond a reasonable doubt that Dr. Wang acted “knowingly,” “willfully,” and with a specific intent to defraud. (Doc. 1 at ¶¶ 29, 34, 15). ORI’s findings have no place in a criminal case, just as a finding of culpability to a victim in a civil case does not mean that a criminal defendant is guilty beyond a reasonable doubt.

Second, the court that decided the only ORI case cited by the Government did not even analyze the analytical method used there. *Brodie v. HHS*, 796 F. Supp. 2d 145, 157 (D.D.C. 2011). Instead, the court simply concluded that the administrative law judge had not acted arbitrarily and capriciously. *Id.* *Brodie* has no application to this criminal case.

Third, ORI does not rely solely on particular tools and methods of image analysis. Instead, it requires additional fact-finding once discrepancies have been discovered before it will make a finding of fabrication or misconduct. Office of Research Integrity, Samples ORI – The Office of Research Integrity (last accessed

September 16, 2025). According to ORI's website, "[f]orensically, you can only 'de-authenticate' an image (i.e., show that it has discrepancies)." (*Id.*). De-authentication *begins* an investigation. (*Id.*). That is, "[a] discrepancy in the image should not be conflated with a finding of falsification of data, or, for that matter, of Research Misconduct. Making those distinctions require[s] additional fact-finding." (*Id.*).

In other words, while ORI may use certain tools for image analysis, it uses them only as a starting point in its investigations. The Government has not shown what "additional fact-finding" goes into an ORI investigation once discrepancies are discovered or that Dr. Brookes' method employed those "additional fact-finding" steps to supposedly invalidate Dr. Wang's data.

Fourth, ORI never adopts Dr. Brookes' particular method of image analysis, which he refers to as a "3-stage pipeline" comprised of eight analytical methods, and Dr. Brookes does not cite ORI as the source of his particular method. (Ex.1 at 12, 15). Nor did ORI ever analyze Dr. Wang's work. The Government tries to avoid this with some logical gymnastics, claiming that because ORI uses a combination of tools and methods to conduct "image analysis" then Dr. Brookes' different method of "image analysis" must also be valid as applied to Dr. Wang's work. (*See, e.g.*, Doc. 91 at 6-7). This is the same as saying because some form of "blood testing analysis" is used and generally accepted in the medical field then Elizabeth Holmes and Theranos's finger prick "blood testing analysis" method must also be valid. In reality,

each scientific method must be separately validated and accepted before it becomes admissible as expert testimony. The Government cites nothing – not a case, ORI decision, or journal article – that validates his “3-stage pipeline” method. The reason why is simple – Dr. Brookes made up the method, and the method has never been tested or validated, whether by ORI or otherwise.

3. Dr. Brookes admits his opinions are neither held to the requisite degree of certainty nor generally accepted.

In an interview conducted by Special Agent Weeks with Dr. Brookes after Dr. Wang filed his motion in limine, Dr. Brookes admits he “cannot rule out that certain of Dr. Wang’s relevant images may be missing.” (Exhibit 11). In other words, Dr. Brookes admits that his opinion does not provide proof beyond a reasonable doubt that Dr. Wang manipulated images because Dr. Brookes is not sure he is analyzing the complete set of images in the first place.

As to his methods, Dr. Brookes concedes that “the analysis of fraudulent scientific imagery is a *new and unusual thing* and no degree exists related to the analysis and identification of scientific fraud.” (*Id.* (emphasis added)). If Dr. Brookes is not sure about his own opinions, a jury without scientific training should not be asked to consider them, and they should not be admitted for the purpose of bolstering the Government’s attempt to deprive Dr. Wang of his liberty.

Dr. Brookes and the scientific community are far from consensus on a generally accepted, tested, and accurate method of image analysis, let alone one that

is admissible in a criminal trial. This Court should exclude Dr. Brookes' testimony and grant Dr. Wang's motion.

Dated: September 16, 2025

Respectfully submitted,

/s/ Jennifer L. Beidel

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CERTIFICATE OF SERVICE

I hereby certify that on the 19th day of September, 2025, I filed the foregoing DEFENDANT’S REPLY IN SUPPORT OF HIS MOTION TO EXCLUDE DR. BROOKES’ TESTIMONY using the Court’s CM/ECF system. The CM/ECF system sent a “Notice of Electronic Filing” to all counsel of record who have entered an appearance in this matter.

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